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(54) Seed deposition apparatus

(57) A coulter comprising a double disc opener (1) with feed means (5) that feeds material to the space between the discs so as to pass into the slit opened in the ground by the discs characterized in that second feed means (9) is provided adjacent to the outer face of one or each disc so as to feed material to the soil alongside said slit (6).

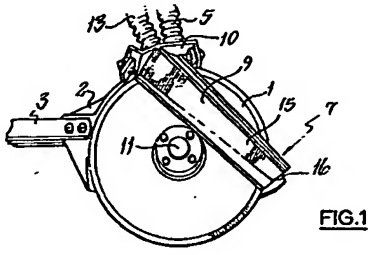

FIG.1

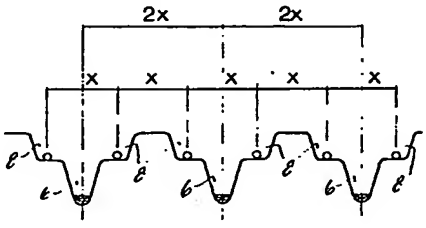

FIG.4

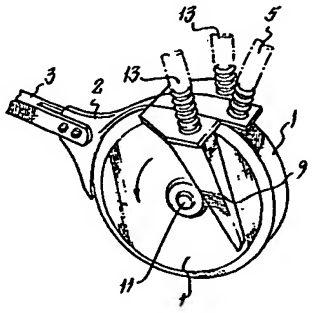

FIG.6

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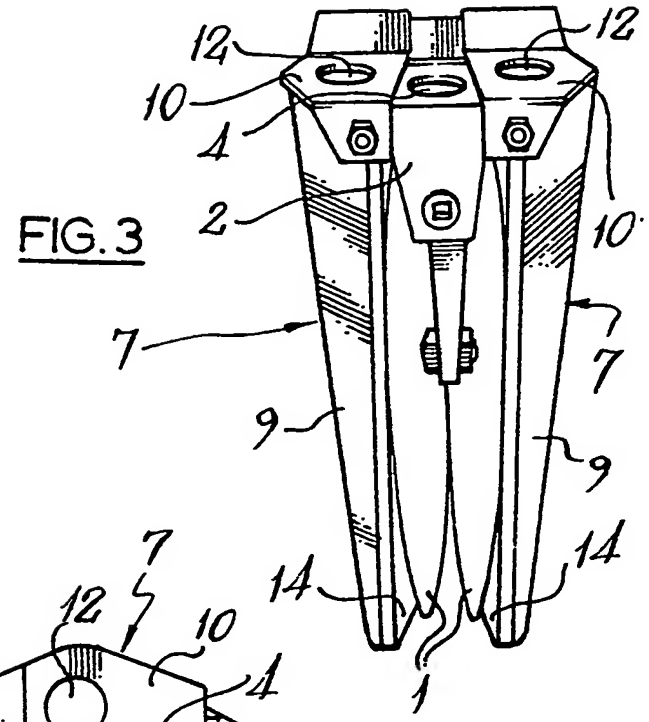

FIG. 3

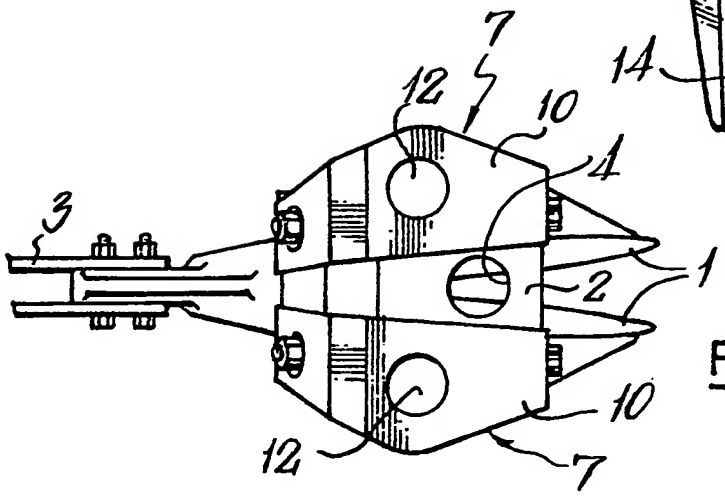

FIG. 2

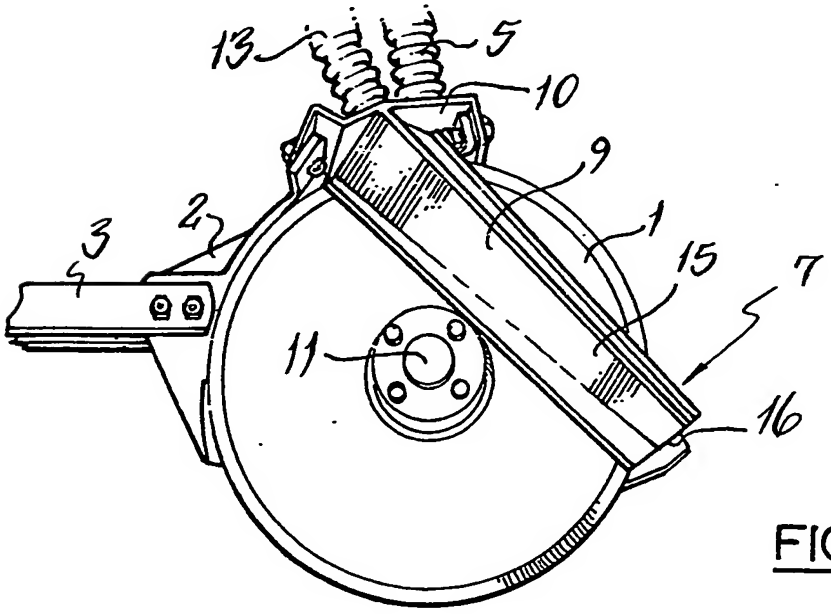

FIG. 1

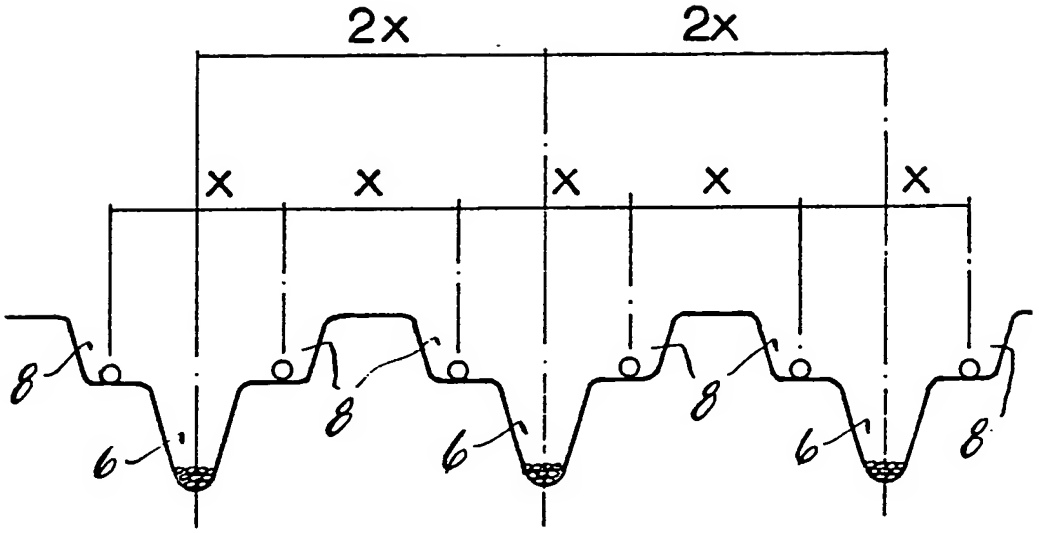

FIG.4

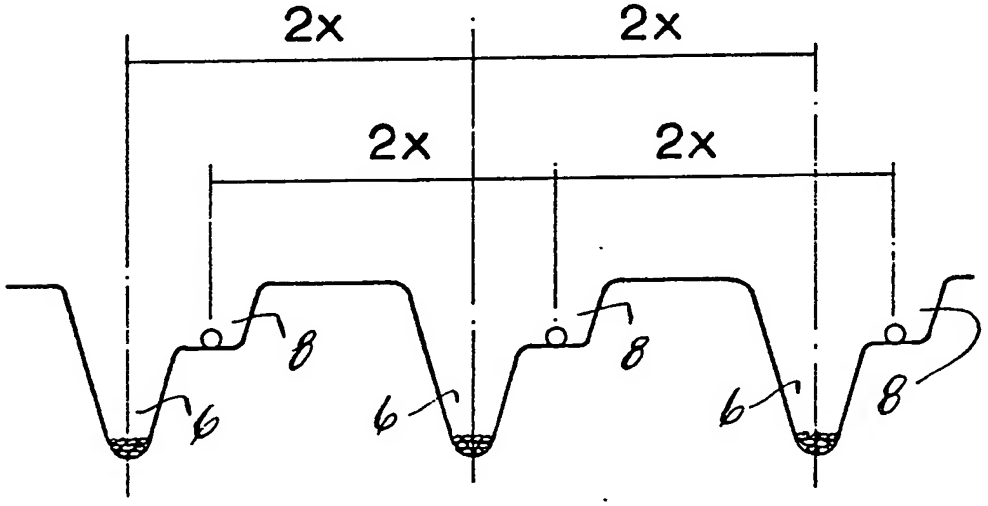

FIG.5

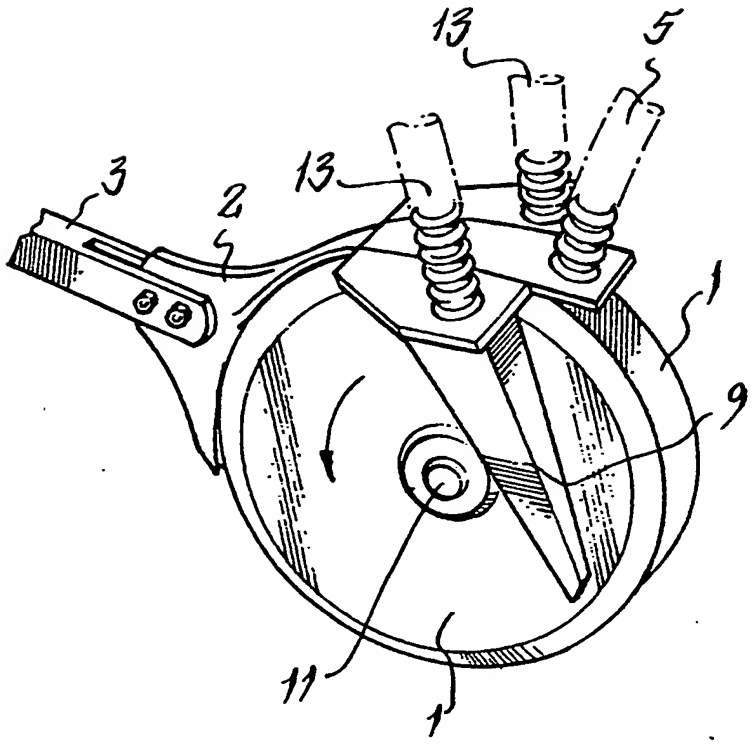

FIG. 6

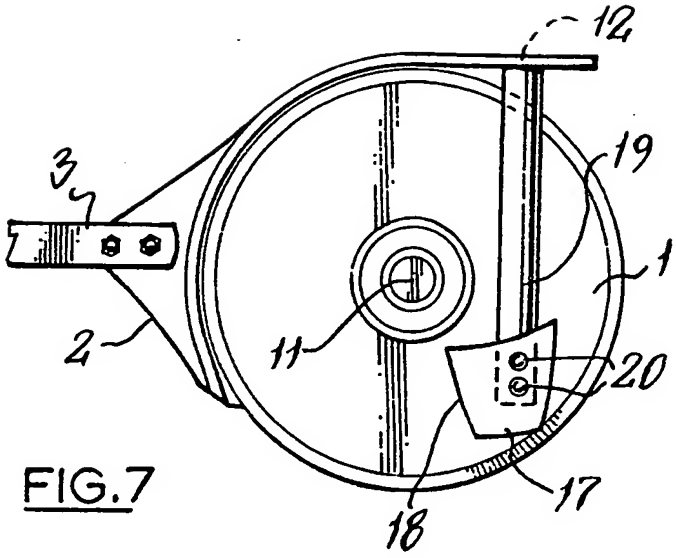

FIG.7

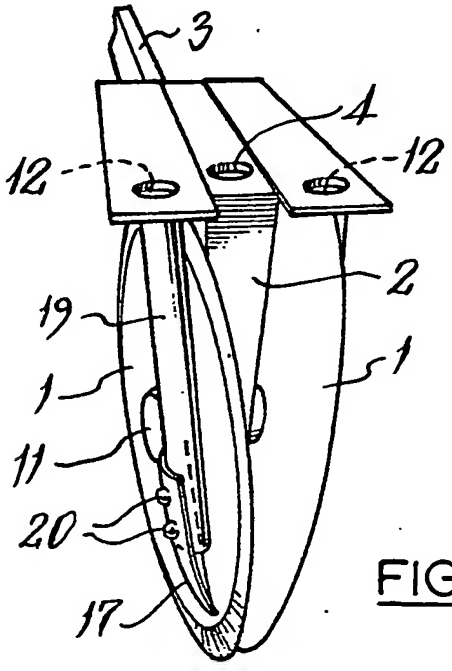

FIG. 8

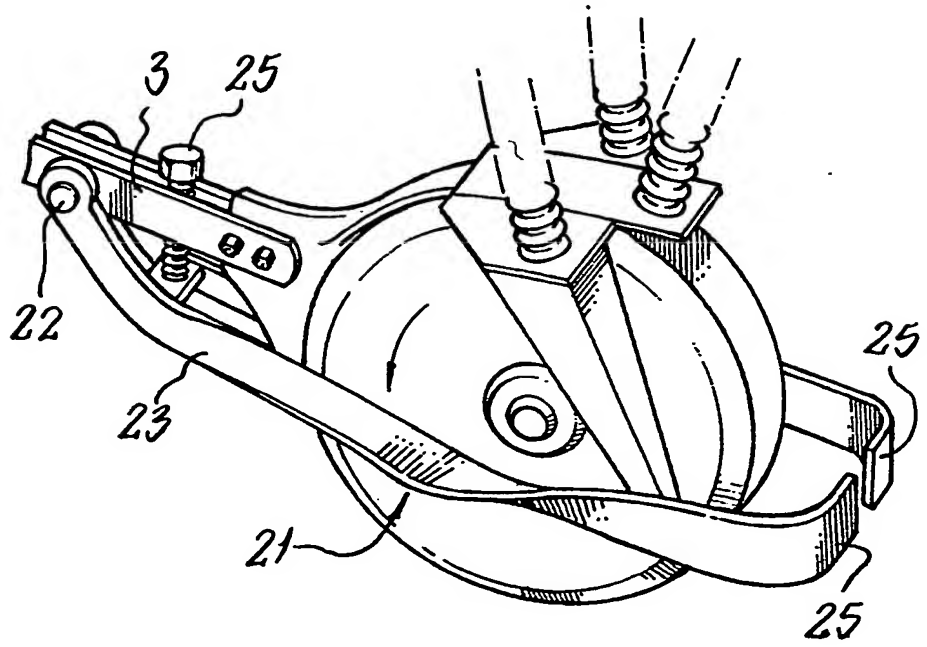

FIG.9

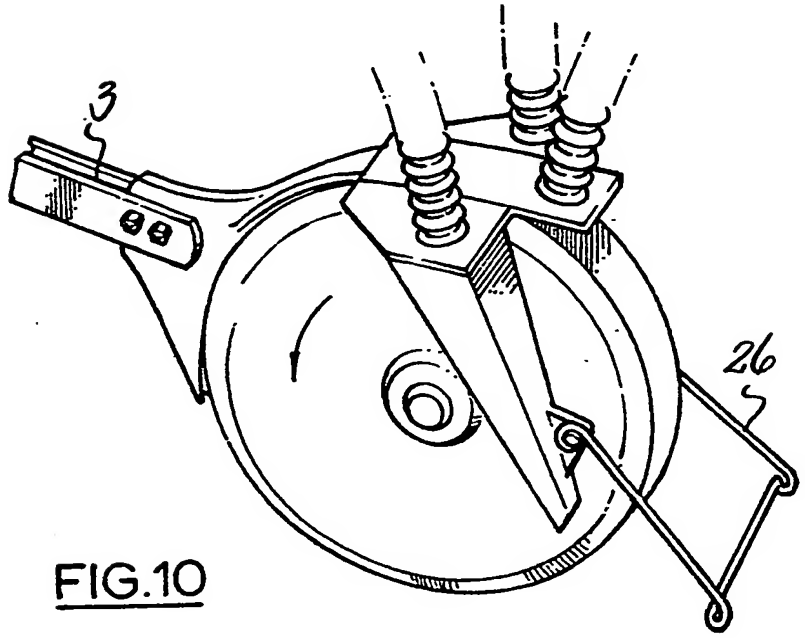

FIG.10

SPECIFICATION

Seed deposition apparatus

This invention relates to seed deposition apparatus such as, for example, a seed drill.

It has been appreciated that the crop yield per unit area can be increased by sowing the seeds more evenly over the area, and that if cereal seed is sown randomly in rows then a row spacing of approximately 2½ inches closely approaches the ideal seed spacing. However, such close row spacing presents technical problems with conventional coulters because of the restricted space in which they have to operate. This is true of conventional double disc coulters in which seed and fertilizer is generally fed to the space between the two discs so as to fall into the slit formed by them in the ground.

It has also been appreciated that fertilizer is best placed away from seeds to avoid scorching and that the fertilizer is used to the best advantage to give increased yields if it is placed below but within 2 inches of the seeds. Also, it is known to provide a single disc coulter with seed and fertilizer feed means that supplies seed and fertilizer alongside one another in the slit formed by the disc with the fertilizer below the seed.

An object of the present invention is to provide a coulter that is suitable for sowing rows of seed at a close spacing of approximately 2½ inches with fertilizer below but within 2 inches of the seed.

This object is achieved according to the invention by providing a coulter comprising a double disc opener with first feed means that feeds material to the space between the discs so as to pass into the slit opened in the ground by the discs characterised in that second feed means is provided adjacent to the outer face of one or each disc so as to feed material to the soil alongside said slit.

If the second feed means feeds material to both sides of the discs, then they can sow two rows at the required spacing of 2½ inches, the minimum limit on the spacing being determined by the width of the two discs.

Placement of fertilizer below the level of the seeds can be achieved by feeding fertilizer between the discs to the deepest part of the slit opened by them.

Preferably, a soil engaging member is located adjacent to the outer face of one or each disc so as to engage the soil and form a furrow in the adjacent shoulder of said slit of a shallower depth than said slit, said second feed means serving to feed material into said furrow.

Each soil engaging member may take the form of a plate-like member located alongside the disc to deflect soil away from it and so form the furrow. Possibly said second feed means carries said plate-like member at its lower end.

Alternatively, the soil engaging member may incorporate the second feed means, for example, said soil engaging member may comprise a tubular feed member with a lower end that engages the ground to form the furrow.

The invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a side view of a coulter according to one embodiment of the invention,

Figure 2 is a plan view of the coulter of Figure 1,

Figure 3 is a rear view of the coulter of Figure 1,

Figure 4 is a schematic drawing showing the form of the openings made in the soil by a coulter or coulters according to Figure 1,

Figure 5 is a schematic drawing showing the form of the openings made in the soil by a modified form of the coulter of Figure 1,

Figure 6 is a side view of a modified form of the coulter of Figure 1,

Figure 7 is a side view of a coulter according to an alternative embodiment of the invention,

Figure 8 is a rear view of the coulter of Figure 7,

Figure 9 is a side view of the coulter of Figure 1 fitted with depth control means, and

Figure 10 is a side view of the coulter of Figure 1 fitted with seed covering means.

Figures 1 to 3 illustrate a coulter according to the invention comprising a double disc opener, the two discs 1 being rotatably supported on either side of an axle support block 2 that is connected to a drag bar 3. The axes of the two discs 1 are inclined such that the discs converge downwards and forwards in the conventional manner for a double disc coulter. The support block 2 projects above the edges of the discs along their upper forward portions and is formed with an aperture 4 that passes downwards from the upper surface of the block 2 and opens above the ground between the discs. The upper end of the aperture 4 is adapted to receive the delivery end of a fertilizer supply pipe 5 so that fertilizer can be fed into the centre of the slit formed between the discs (See Figure 4).

A soil engaging device 7 is provided adjacent to the outer face of each disc 1 so as to form a furrow 8 in the shoulder of said slit 6 and to feed seed into said furrow (See Figure 4). Each device 7 comprises a tubular conductor 9 that is connected to the top of the support block 2 via a support flange 10 and extends downwards and rearwards above the disc hub 11 terminating just beyond the trailing peripheral edge of the disc. An aperture 12 in the flange 10 communicates with the upper end of the conductor 9 and is adapted to receive the end of a seed supply pipe 13. The conductor 9 is substantially triangular in section and has an inner face 14 alongside the disc 1 and an outer face 15 that diverges rearwards away from the disc 1 so that it readily deflects soil outwards to form said furrow 8. The inclination of the leading edge of the conductor 9 further aids said soil deflection. The open lower end 16 of the conductor 9 terminates in a plane that is inclined rearwards and upwards from the disc at an acute angle with the ground surface so as to direct seed more effectively into the ground (See Figure 1).

The form of the opening made in the soil by the

coulter of Figures 1 to 3 is shown schematically in Figure 4, the seeds being placed in the furrows 8 formed by the lower ends of the conductors 9 at a spacing of $x = 2\frac{1}{2}$ inches, and the fertilizer being placed in the deeper central slit 6 between the two furrows 8 formed in the shoulders of the slit. The drawing shows a cross-section through three coulter passes spaced $2x = 5$ inches apart so that the adjacent rows of seed of adjacent passes are also spaced $2\frac{1}{2}$ inches apart.

The coulter of Figures 1 to 3 can also be used to sow a single row of seeds by feeding seeds to just one of the conductors 9. This would be desirable in sowing crops such as peas and beans or sowing seeds in conditions that will not support narrow rows but where placement of fertilizer away from the seeds is essential. Further, the coulter could be especially adapted to sow single rows by providing just one conductor 9 alongside one of the discs. The form of the opening in the ground made by such a modified coulter is illustrated schematically in Figure 5, three adjacent coulter passes at 5 inch row spacing being shown.

In order to ensure that the seed is placed accurately in the furrows 8 and does not fall into the central slit 6, the conductors 9 may be adapted at their lower ends so as to direct the seed outwards.

The conductors 9 of the coulter illustrated in Figures 1 to 3 terminate just beyond the rear peripheral edges of the discs 1 but it will be appreciated that they may terminate short of the edges of the discs 1. Such an embodiment is illustrated in Figure 6. In this embodiment, because the lower end of the conductor 9 is directly alongside the disc 1, the shoulder of the central slit 6 is supported by the disc 1 as the furrow 8 is formed in it. The chance of the shoulder of the slit collapsing as the furrow is formed is therefore reduced.

The embodiment of Figure 6 also illustrates another change in arranging the conductors 9 so that they are more upright and are located rearwards of the hub 11.

Another alternative embodiment of the invention is illustrated in Figures 7 and 8 in which the soil engaging device 7 comprises a plate-like soil deflector 17 having a leading edge 18 that is spaced close to the outer face of the adjacent disc 1 and diverges rearwards away from said face. The leading edge 18 is also inclined rearwards from top to bottom and the deflector plate as a whole converges downwards towards the disc. The rear edge of the deflector plate is spaced away from the disc to allow the escape of seed.

Seed is fed to the space between the deflector plate 17 and disc 1 by a tubular conductor 19. The deflector plate 17 is carried on the lower end of the conductor 19 and is connected to it by two rivets 20. The conductor 19 is connected at its upper end through a flange 10 to the disc support block 2 in a similar manner to that in the embodiment of Figures 1 to 3. A seed supply pipe feeds seed to the conductor through an aperture 12 in the flange 10.

In an alternative embodiment the deflector plate 17 may be supported independently of the conductor 19.

Separate metering units may be provided to feed seed to each outer conductor 9, 19 and to feed fertilizer to the aperture 4 between the discs. However, in an alternative embodiment a single seed metering unit may be provided and the flow split between the two outer conductors 9, 19. In yet other embodiments, the seed may be fed to the aperture 4 between the discs and the fertilizer fed to the two outer conductors 9, 19. The actual feed of seed and fertilizer may be by gravitational or pneumatic action.

Although the double disc opener is inherently suitable for maintaining a constant sowing depth, separate depth control means may be provided. This may take the form of a press-wheel behind the discs, an annular flange on the outer face of one or both discs, or a skid trailing from the drag bar.

A depth control device is illustrated in Figure 9 comprising a pair of skids 21 that are connected to the drag bar 3 by a pivot pin 22 and trail either side of the discs 1, each skid passing round the adjacent conductor 9 to the rear of the discs. The skid is formed from a strip of sheet or plate metal and is twisted through 90° in front of the conductor 9 from a horizontally orientated portion 23 to an upright orientated portion 24. The portion 23 acts as the depth control device, the depth being controlled by adjustment of a screw 25 that couples the two skids to the drag bar 3 rearwards of the pivot pin 22.

The twisted portion of the skid between portions 23 and 24 and the leading end of the upright portion 24 serve as a soil deflector. The trailing ends 25 of the skids are turned inwards towards one another and serve as seed covering means.

A coulter according to the invention may be provided with seed covering means 26 that is connected to the seed conductors 9 on either side of the discs and trails behind them as shown in Figure 10. Depth control means such as a press-wheel may similarly be connected to the seed conductors so as to trail behind the discs.

CLAIMS

1. A coulter comprising a double disc opener with feed means that feeds material to the space between the discs so as to pass into the slit opened in the ground by the discs characterized in that second feed means is provided adjacent to the outer face of one or each disc so as to feed material to the soil alongside the slit.

2. A coulter as claimed in claim 1 further characterized in that a soil engaging member is located adjacent to the outer face of one or each disc so as to engage the soil and form a furrow in the adjacent shoulder of said slit of a shallower depth than said slit said second feed means serving to feed material into said furrow.

3. A coulter as claimed in claim 2 in which said soil engaging member has a leading soil engaging face that diverges rearwards away from the face of said adjacent disc.

4. A coulter as claimed in claim 2 or 3 in which said soil engaging member has a leading soil engaging face that is inclined rearwards from top to bottom.

5. A coulter as claimed in any one of claims 2 to 4 in which said soil engaging member has an outer

face that diverges upwards away from the face of said adjacent disc.

6. A coulter as claimed in any one of claims 2 to 5 in which the lower end of said soil engaging member is located alongside said disc.

7. A coulter as claimed in claim 6 in which the lower end of said soil engaging member is located rearwards of the hub of the discs.

8. A coulter as claimed in claim 7 in which the lower end of said soil engaging member is located in the region of the trailing peripheral edge of said disc.

9. A coulter as claimed in any one of claims 2 to 8 in which said soil engaging member comprises a plate-like member having a rear face opposite the outer face of said disc.

10. A coulter as claimed in claim 9 in which the leading edge of said plate-like member is spaced close to the outer face of said disc.

11. A coulter as claimed in claim 9 or 10 in which said said second feed means comprises a conductor that feeds material to the space between the plate-like member and said disc.

12. A coulter as claimed in claim 11 in which said soil engaging means is carried on the lower end of said conductor.

13. A coulter as claimed in any one of claims 2 to 8 in which said soil engaging member incorporates said second feed means in the form of a passage for the feed of material into said furrow.

14. A coulter as claimed in claim 13 in which said soil engaging means comprises a tubular member through which material can pass.

15. A coulter as claimed in claim 14 in which said soil engaging tubular member has an opening at its lower end lying in a plane that is inclined upwards and rearwards at an acute angle with the ground surface.

16. A coulter as claimed in any one of the preceding claims in which said second feed means feeds material into said furrow so as to direct it outwards away from said slit.

17. A coulter as claimed in any one of claims 2 to 16 in which said discs are rotatably supported on either side of a support member that also supports said soil engaging member.

18. A coulter as claimed in claim 17 in which the soil engaging member is supported through a flange which is connected to the support member above the upper periphery of the adjacent disc.

19. A coulter as claimed in claim 18 in which the soil engaging member comprises a tubular member that communicates with a hole in said flange that is adapted to receive a material supply tube.

20. A coulter as claimed in any one of claims 17 to 19 in which said support member has an aperture through it, the supper end of which is adapted to receive a material supply tube and the lower end of which communicates with the space between the discs.

21. A coulter as claimed in any one of claims 2 to 20 in which a soil deflector is provided to deflect soil away from the soil engaging member along its leading edge.

22. A coulter as claimed in claim 21 in which said deflector is adapted to serve as a depth control skid, said deflector comprising a trailed strip that is twisted in front of the soil engaging member from a substantially horizontal orientation to an upright orientation.

23. A coulter as claimed in any one of claims 2 to 22 in which a seed covering device is connected to the soil engaging member and trails behind the discs.

24. A coulter as claimed in any one of claims 2 to 23 in which a soil engaging member is located adjacent to the outer face of each disc and in which said second feed means comprises a single feed unit and a splitter device that splits material fed from said single feed unit to the furrows formed by both soil engaging members.

25. A coulter substantially as herein described with reference to Figures 1 to 5; Figure 6; Figures 7 and 8; Figure 9 or Figure 10.

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